CS 161
Intro to CS I

More Programming, Variables and Constants
Chap. 1.2
More Binary

• What is each digit called?
• What is a Byte?
• How many numbers can be expressed in a Byte?
  – Signed/Unsigned
• What is the smallest number?
• What is the largest number?
• Help:

http://classes.engr.oregonstate.edu/eecs/spring2013/cs161-001/Exam1Review1.txt

1 less than \(2^n\) bits

\(0 - (2^n - 1)\) bits

unsigned: \(0 - (2^n - 1)\) bits

\(2^n = 256\)

0-127 128 pos
-1 -128 128 neg

unsigned int num_people_in_world
Programming

• Writing **code** that a computer can **execute**
  – Does that mean we have to write in binary?

• High-level language
  – Interpreted
  – **Compiled**
    • High-level -> machine language
    • High-level -> intermediate language
C++ Programming Environment

• Type a program in a .cpp file, `vim hello.cpp`
• Compile program file, `g++ hello.cpp -o hello`
• Run the compiled version, `hello`
• Example: `hello.cpp`
  ```cpp
  #include <iostream>
  int main() {
    std::cout << "Hello CS 161 Class!!!";
    return 0;
  }
  ```
More C++

- Libraries
  - Example: `#include <iostream>
- Functions
  - Perform particular action/computation
  - Requires special function: `main`
    - `int main() { .... }
- Statements
  - Ended by semicolon
  - Examples:
    - `std::cout << "Hello World";
    - `return 0;`
More C++

• Programming Style: please read our class style guide
  
  [link]
  
  – Program Header/Description
  – Placement of {}
  – Indentation: spaces vs. tabs

• String Literals (Strings)
  – Quotation marks not single quotes!
    • INCORRECT: std::cout << ‘Hello World’;
  – Do not span more than one line!
    • INCORRECT: std::cout << “Hello World”;

  

More C++

• Escape Sequences
  – Display special characters
  – Use backslash, \, before special character to print

• Examples:
  std::cout << "\"Hello World\"\n";

• Refer to p.18 for common escape sequences.
Comments

• Ignored by compiler
• Comment a block of code: /*.....*/
• Comment one line of code: //
• Why use these?
• What are you required to have right now?
  – Header at beginning of program
  /*******************************************
  ** Program: hello.cpp
  ** Author: Jennifer Parham-Mocello
  ** Description: This program prints hello world to the console
  ** Input: none
  ** Output: hello world text
  *******************************************/
Data Type

• What is data?
  – Information
  – Ex: std::cout << “Hello World!” << std::endl;
  – Simple value
    • Literals, e.g. 23, 79.5, “Hello”, etc.

• What is a data type?
  – Description of the kind of information
    • Primitive Data
    • User Created – (we will cover later)
C++ Primitive Types

- char, double, float, int, long, short, bool
- Fundamental
  - **int**: whole numbers, e.g. 45, -89, 0
  - **double**: real numbers, e.g. 2.612, -30.5, 2.3e5
  - **char**: characters, e.g. ‘A’, ‘&’, ‘x’, ‘\’
- Refer to p. 9 for types and sizes
Variables

• What is a variable?
  – Memory location with name and type to store value

• What is a declaration?
  – Statement requesting variable w/ name and type
  – Examples:
    double height;
    int age;
Variables/Identifiers

• Identifier: name given to item in program
  – Ex. Variables and Functions
  – Start with letter
    • Letters include: upper-case, lower-case, underscore (_)
  – Followed by sequence of letters and digits
  – Good examples: hiThere, two_plus_two, _hello
  – Bad examples: 5dogs, hi-there, hello there

• Can’t Use Keywords, Appendix 1, p. 915
Variables

• How do we get a value in the variable?
  – Assignment Statement
    ```
    int age;
    age = 20;
    Or
    int age = 20;
    ```
  – = IS NOT equal to!!!!!!
    • “gets” or “is assigned”
Printing Variables

• C++: cout
  – Example:
    
    ```cpp
    std::cout << "The integer value is: " << value;
    ```
  – What about the newline?
Constants

• What is a constant?

• How do we define a constant?
  – Use of a macro
    • #define
    • Placed at top of program
    • No semicolon at end
    • Example: #define MAX_SIZE 100
  – Use of const
    • Same as declaring a variable but preface with const
    • Example: const int MAX_SIZE = 100;
Assignment #1 Macros

• C++: <climits>
• Use MIN and MAX macros from library
  http://www.cplusplus.com/reference/clibrary/climits/
  (Note that the values listed are not the values on our system!!!)
  – INT_MAX
  – INT_MIN
  – LONG_MAX
  – LONG_MIN
  – SHRT_MAX
  – SHRT_MIN
• Remember unsigned too...